



NASA STTR 2007 Phase I Solicitation

T6.02 Active Vibration Control for Ground Support Equipment

Lead Center: KSC

Equipment located near a major rocket launch is exposed to extreme environments including heat, unsteady rocket plume impingement, acoustics and vibration. NASA's experience shows that considerable attention to the protection of critical electronic ground support equipment housed in a mobile launch platform or on adjacent tower structures is required.

The effect of high acoustic and exhaust blast loading on the launch structures results in large amplitude motions of the structural panels, including floors supporting racks of electronics. Measured acceleration spectra vary considerably from area to area but a general characterization is that the peak frequencies lie in the range below 100 Hz and amplitudes of several g's rms or higher. Typically, electronic systems are housed in a rack structure, for example a 19-inch rack, which might be 2 meters tall and weigh in the vicinity of 500 kg. Passive vibration isolator systems required to support this weight often have natural resonance within the broad excitation spectrum of the floor, resulting in less than desirable equipment protection. One consequence is the need for extensive check out of systems after each launch and often repairs. Another consequence is the need for extensive design and qualification testing to ensure the survivability of this equipment. Development of an effective vibration isolation system will significantly reduce life cycle costs and enhance equipment reliability.

The relatively short duration of the high vibration environment suggests that an active vibration control system using locally stored energy could provide a significant improvement in suppressing vibration effects. This call requests proposals for vibration control systems that would be highly reliable and capable of sensing and reducing vibration effects in ground support electronic racks. This technology is envisioned to consist of some type of platform with actuators, passive elements (springs, dampers), sensors, and a local energy source (if required). Alternately, active isolator kits could be developed that attach to the corners of a larger platform to allow designers to support a row of racks but a method of integration to allow the control of all 6 degrees-of-freedom of the complex assembly must be provided.

Applications of this technology go beyond launch equipment to any environment requiring vibration isolation of critical equipment from episodic and intense events. These range from earthquake protection and transportation to

military applications. The goal is to have a platform system that can be applied to expensive equipment where the specific vibration excitation is intense and somewhat poorly defined so that a designer can specify the system with confidence and without detailed analysis, and without requiring extensive testing of the components being protected.